

What is claimed is:

1. A substrate processing apparatus, which has a high frequency power supply part with a controllable high frequency power source, applies a high frequency power from the high frequency power source to a discharge electrode provided in a processing chamber through a matching unit, and generates a plasma in the processing chamber, comprising:

at least a detector provided between the high frequency power supply part and the matching unit, or between the matching unit and the discharge electrode, for detecting a reflected wave of the high frequency power reflected from the discharge electrode; and

a controller controlling the high frequency power source so as to temporarily stop or temporarily decrease an application of the high frequency power to the discharge electrode, in accordance with a detection result of the detector,

wherein the controller functions to control the high frequency power source so as to temporarily stop or temporarily decrease the application of the high frequency power to the discharge electrode, and when the high frequency power is applied again, continuously apply the high frequency power without temporarily stopping or temporarily decreasing the application of the high frequency power before a predetermined time period passes, and after the predetermined time period passes, temporarily stop or temporarily decrease the

application of the high frequency power to the discharge electrode in accordance with the detection result of the detector.

2. A substrate processing method for processing a substrate by inserting a substrate in a processing chamber, exhausting an atmosphere out of the processing chamber while introducing the gas thereinto, applying the high frequency power to the discharge electrode from the high frequency power source through a matching unit, and thereby generating a plasma in the processing chamber, wherein an application of the high frequency power is controlled to make it possible to:

temporarily stop or temporarily decrease the application of a high frequency power to a discharge electrode when a reflected wave of the high frequency power from the discharge electrode is detected; thereafter when the high frequency power is applied again,

continuously apply the high frequency power without temporarily stopping or temporarily decreasing the application of the high frequency power before a predetermined time period passes; and after a predetermined time period passes,

temporarily stop or temporarily decrease the application of the high frequency power to the discharge electrode when the reflected wave is detected.